United States Patent [19]

Gortz et al.

[11] **3,767,078**

[45] **Oct. 23, 1973**

[54] **BLADDER TYPE DISPENSER**

[76] Inventors: **Norman Gortz,** 11151 Coventry Pl., Santa Ana; **Michael B. Maccarone,** 17932 Gillman Ave., Irvine, both of Calif.

[22] Filed: **Nov. 3, 1970**

[21] Appl. No.: **86,506**

[52] **U.S. Cl.** ..... **220/63 R,** 220/85 B, 222/95, 222/386.5

[51] **Int. Cl.** **B65d 25/14,** B65d 35/28

[58] **Field of Search** ..... 220/63 R, 85 B; 222/92, 386.5, 406, 407, 94, 95, 405, 206

[56] **References Cited**

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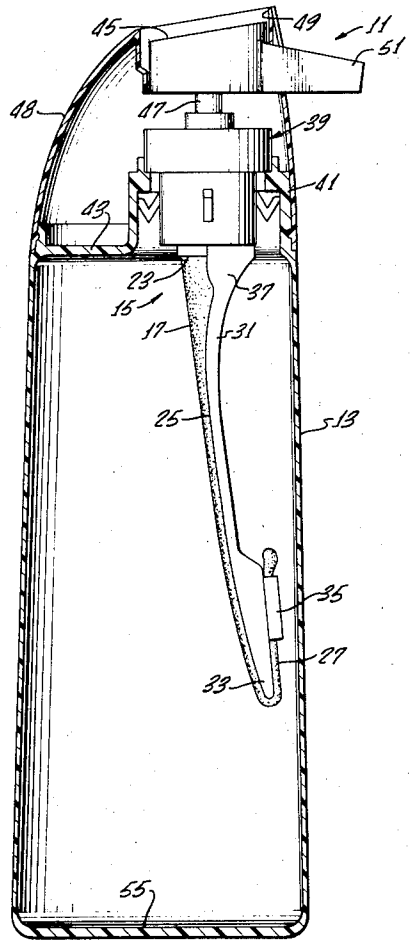
Primary Examiner—George E. Lowrance
Attorney—Fowler, Knobbe and Martens

[57] **ABSTRACT**

A dispenser wherein a resilient bladder is stretched over a curved surface presented by a supporting rib which extends into the dispenser. Both the bladder and the supporting rib are elongated and are anchored at one end in a dispensing valve assembly mounted in a wall of the dispenser. The bladder is open at its anchored end and communicates with a valved passage in the valve assembly so as to discharge its contents therethrough. At its opposite end, the bladder is closed and, to make sure that it will expel all of its contents, is attached to the supporting rib in such a manner as to put the body of the bladder into tension along its length.

17 Claims, 60 Drawing Figures



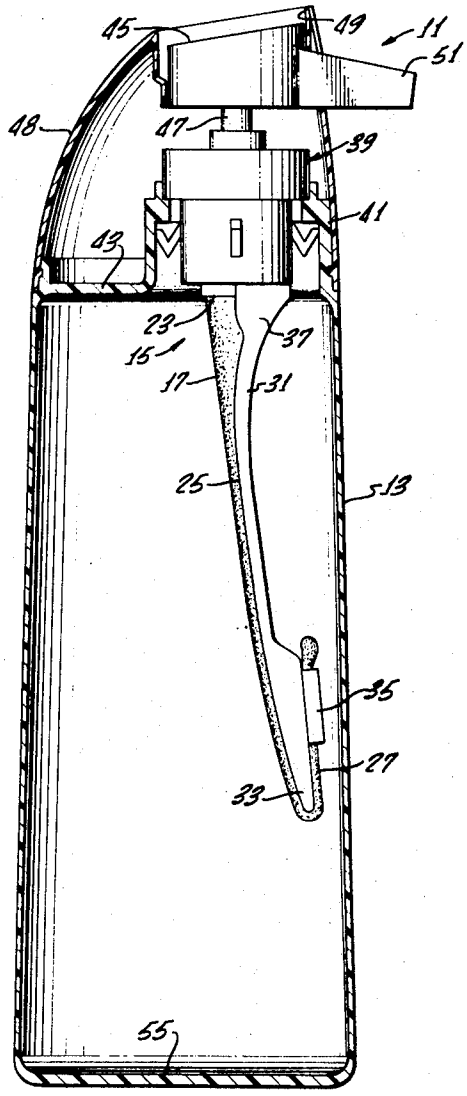


FIG. 1.

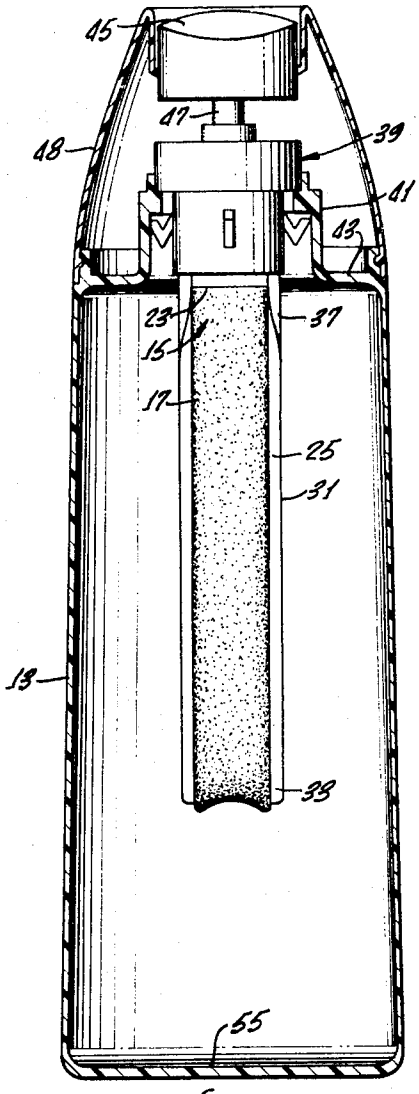
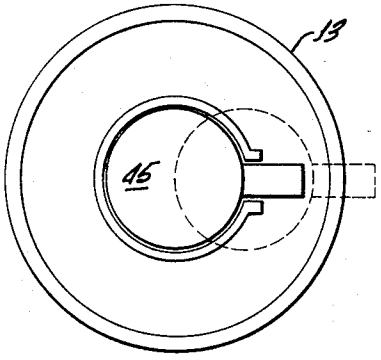


FIG. 2.



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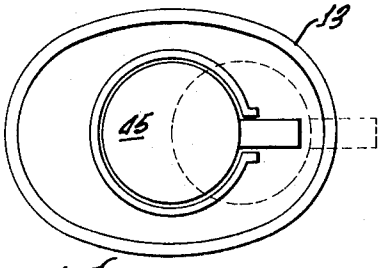

FIG. 6.

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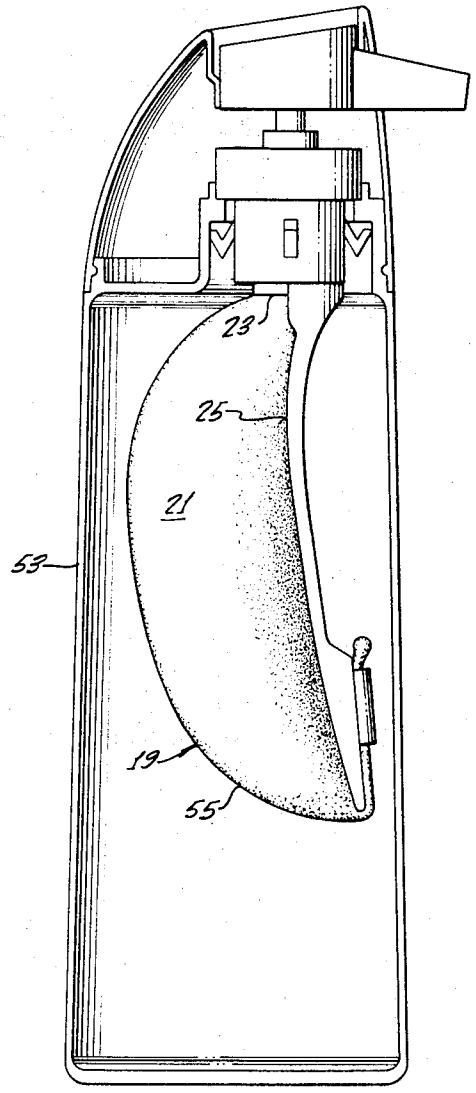
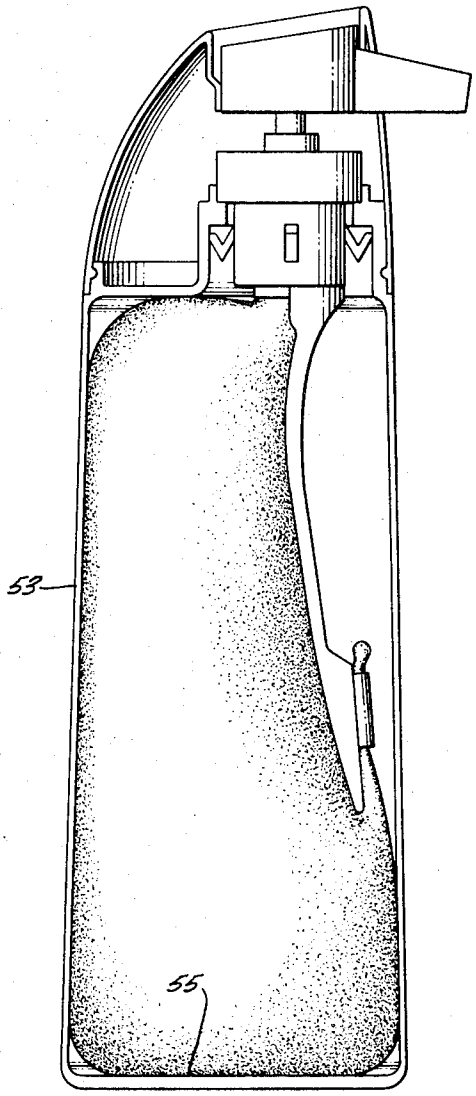


FIG. 3.



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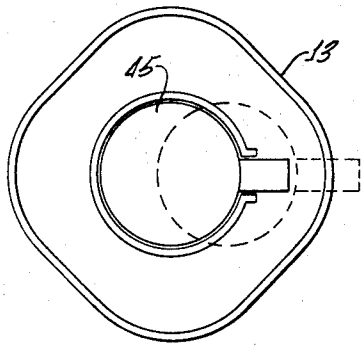

FIG. 7.

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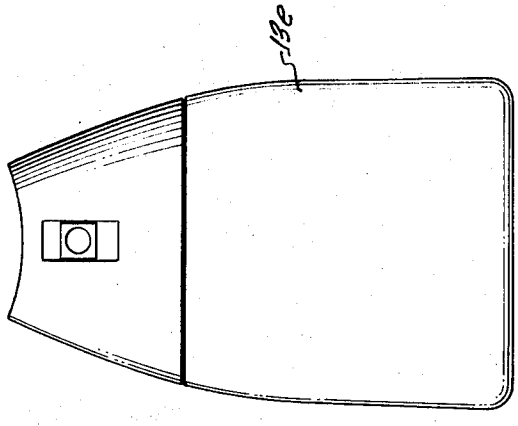


FIG. 10.

FIG. 9.

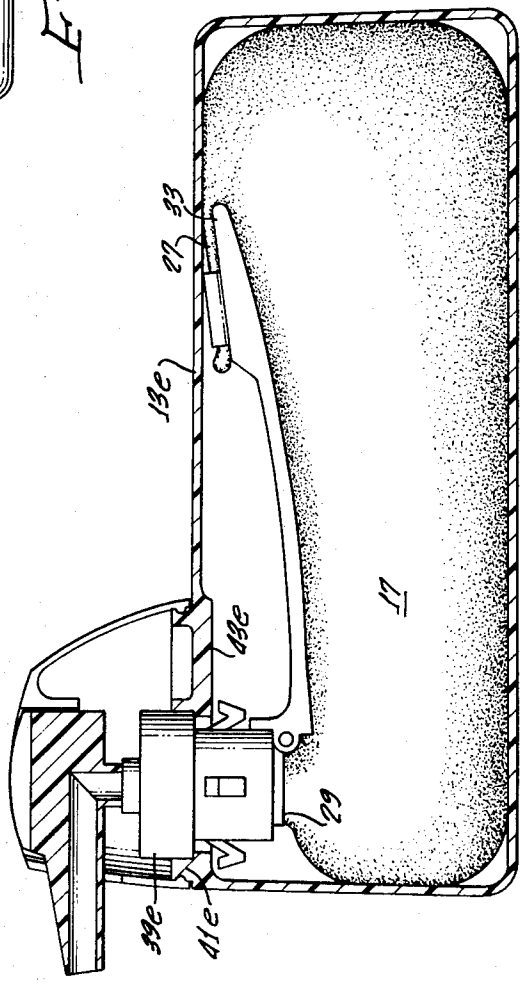
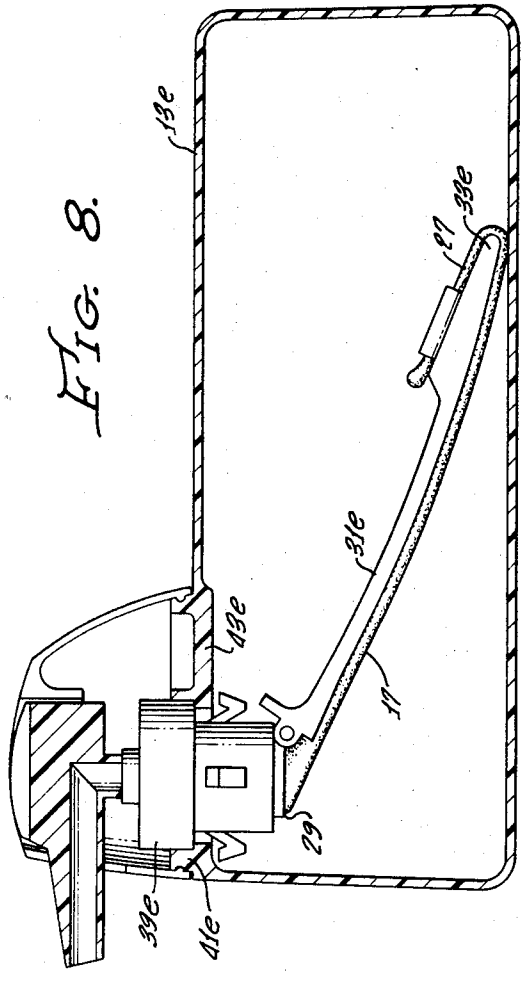


FIG. 8.



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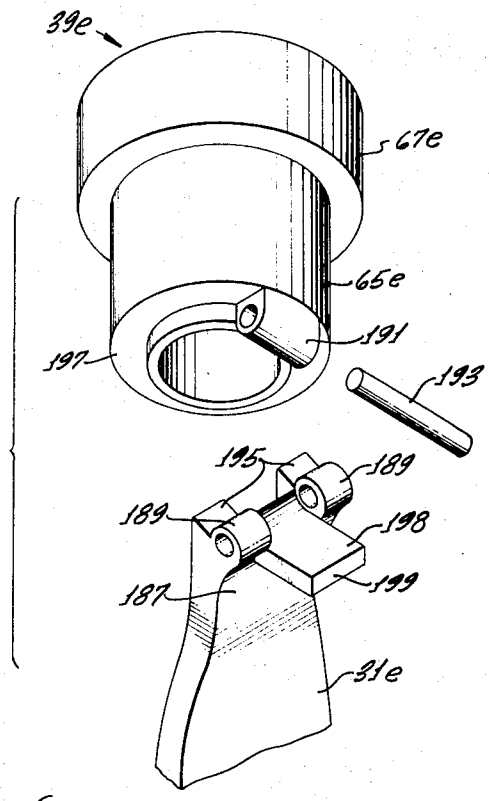

FIG. 11.

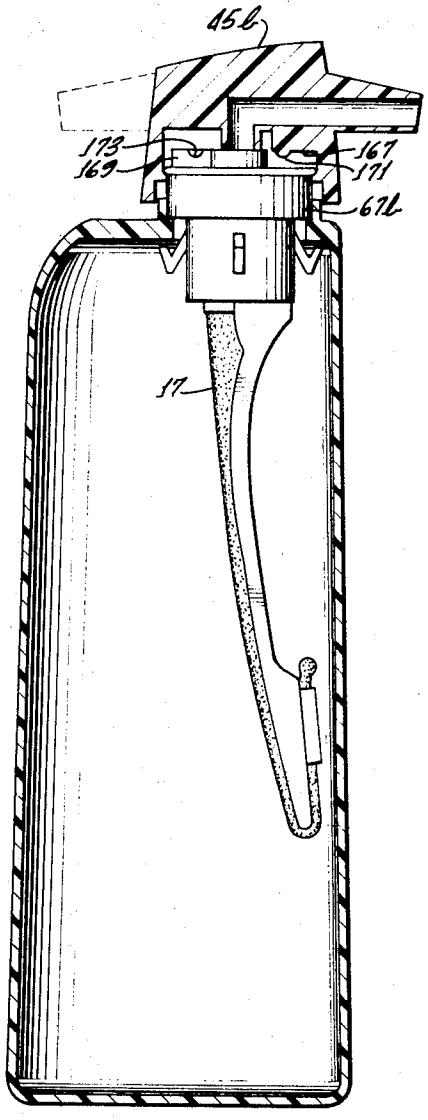

FIG. 13.

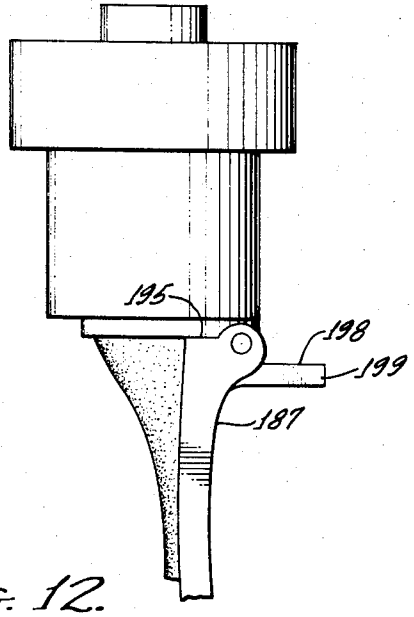

FIG. 12.

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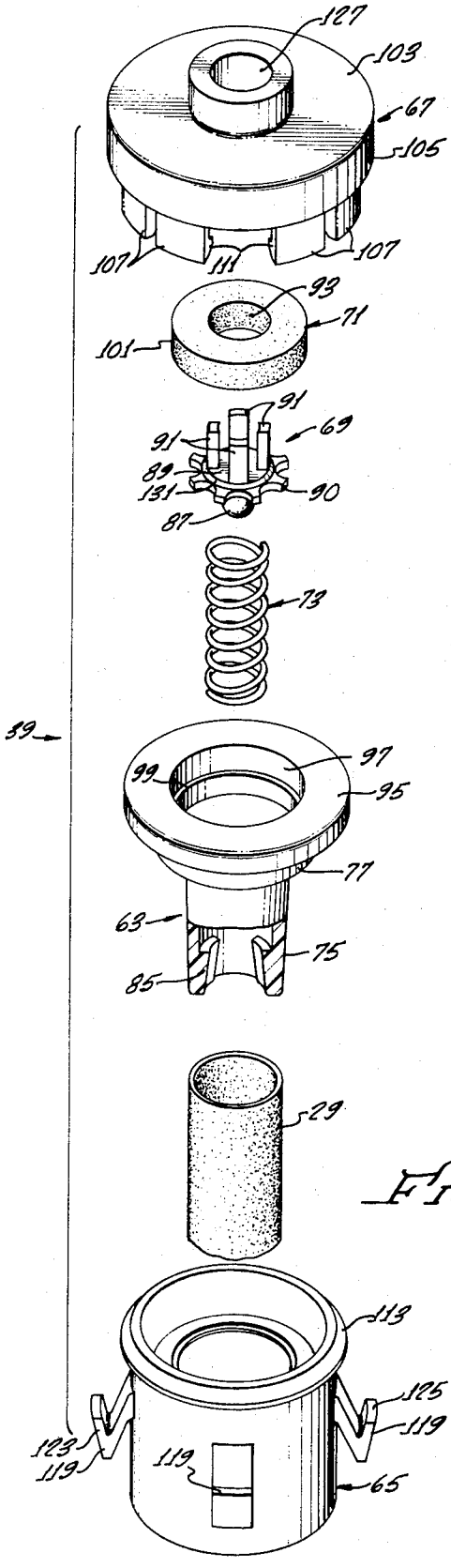

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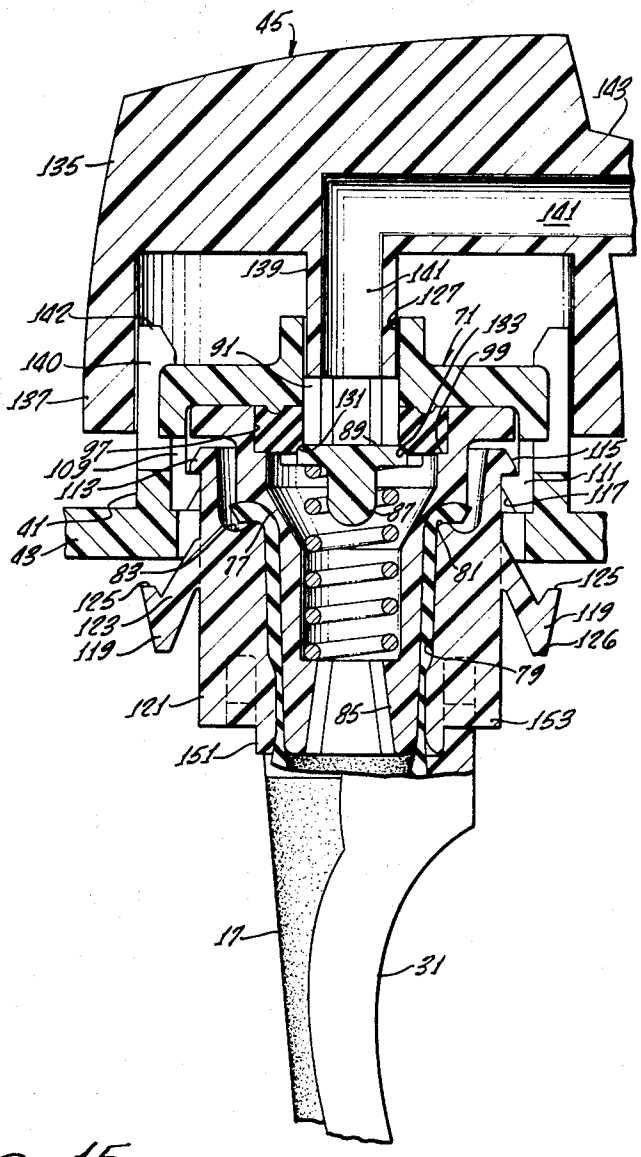

FIG. 15.

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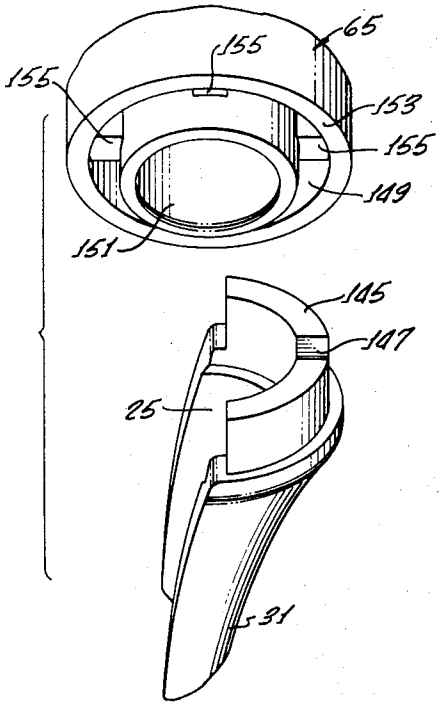
FIG. 17.



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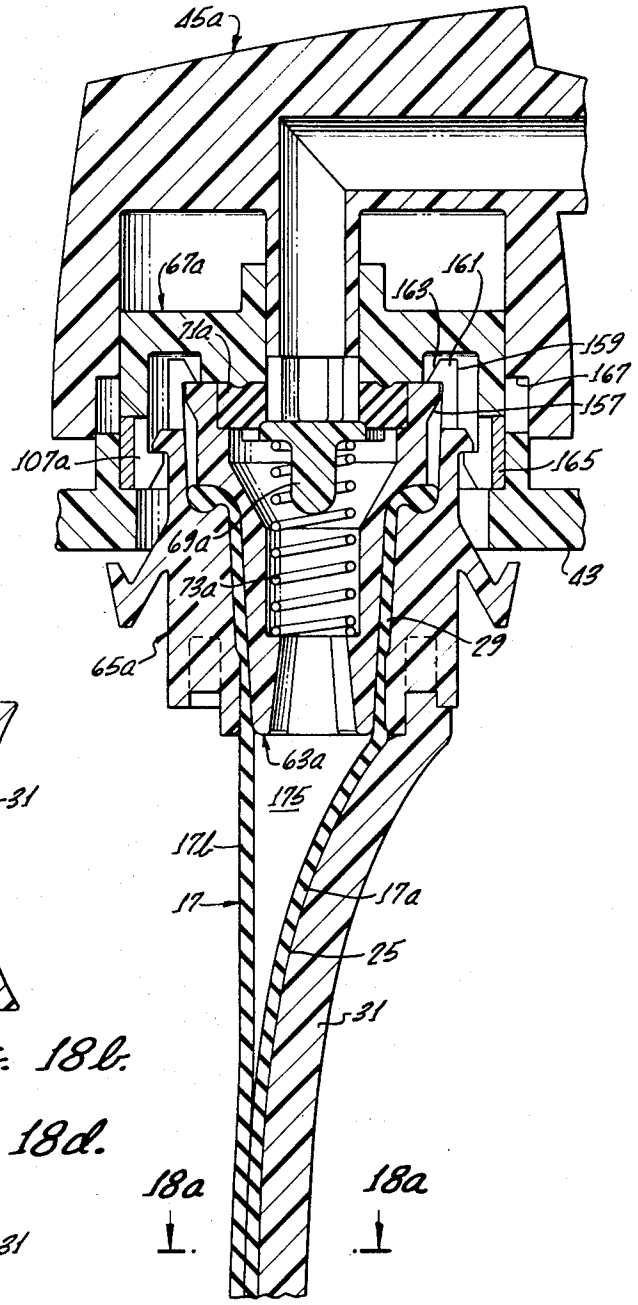

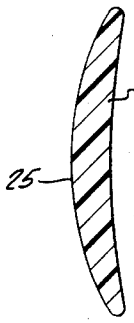

FIG. 18a.

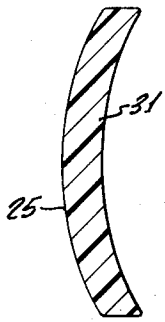

FIG. 18b.

FIG. 18c.

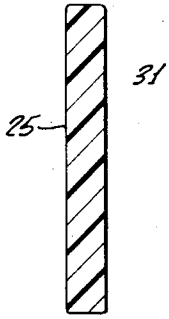

FIG. 18d.

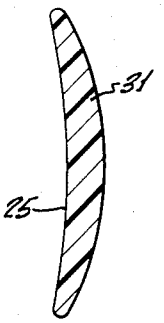

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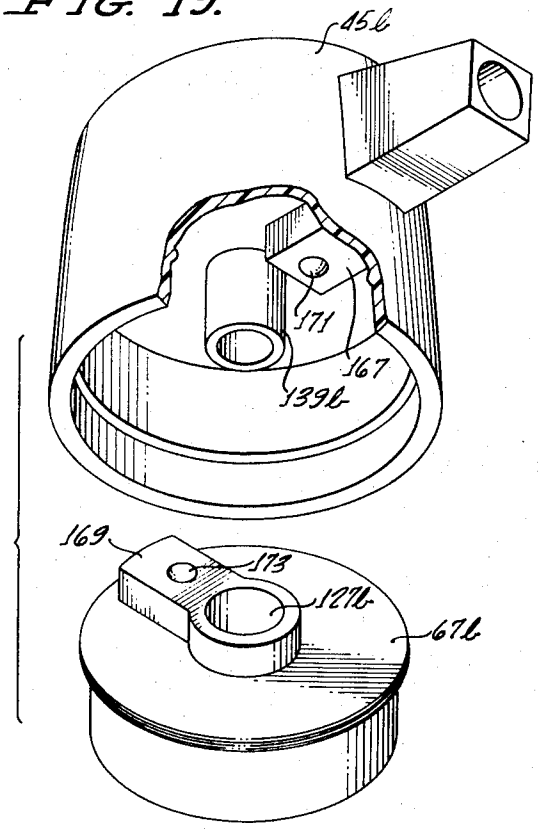
FIG. 19.



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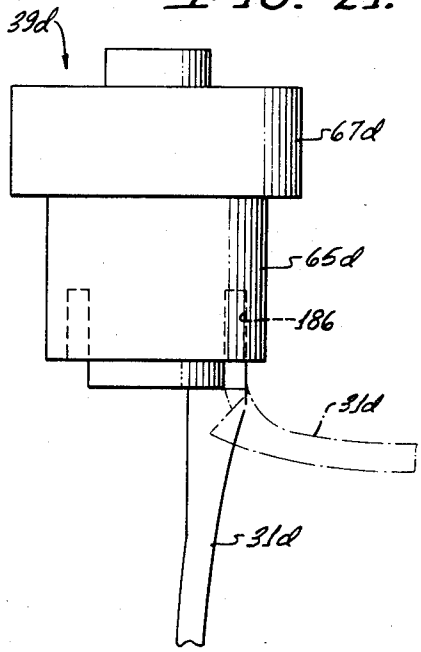

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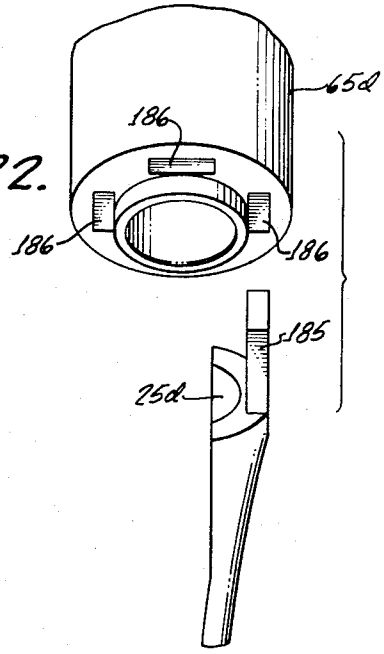

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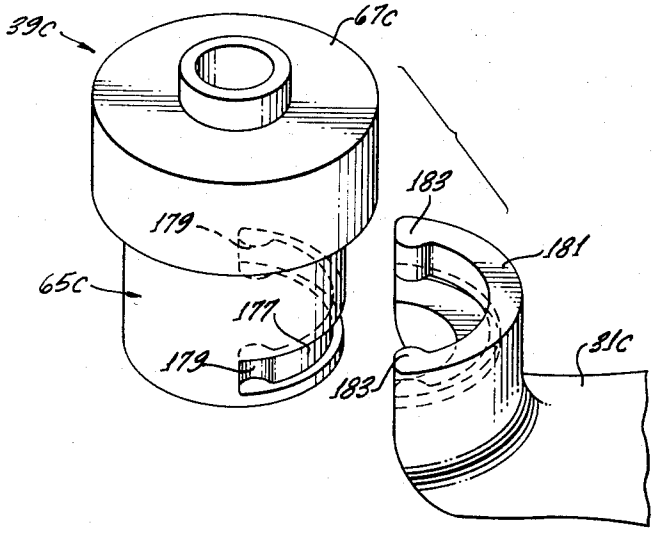

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FIG. 23.

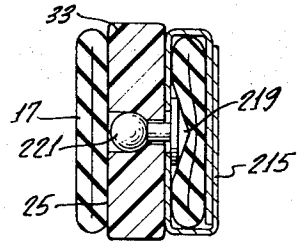


FIG. 23a.

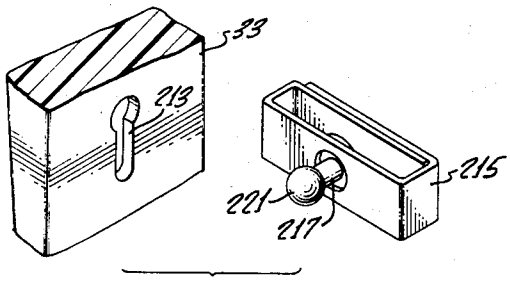
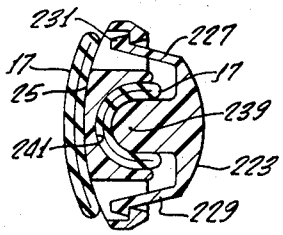


FIG. 24.



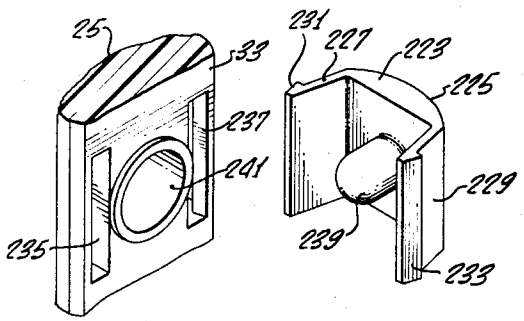
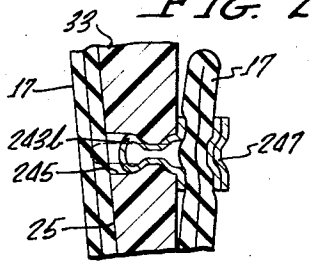


FIG. 24a.

FIG. 25a.



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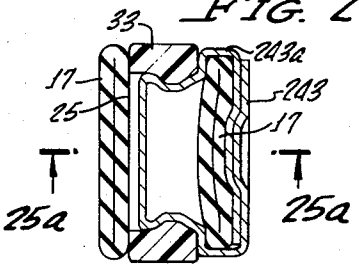

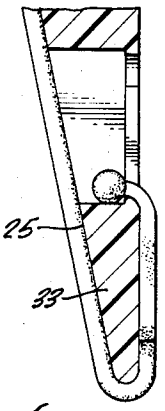

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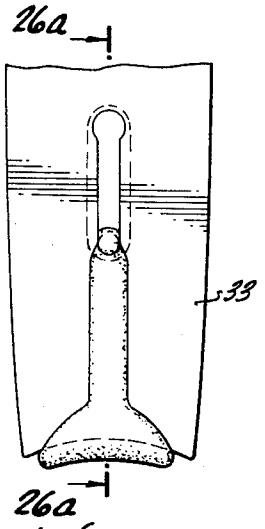

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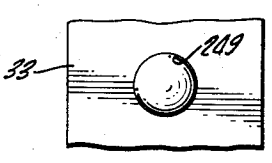

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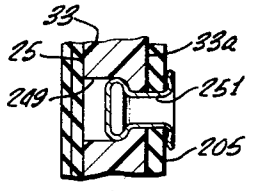

FIG. 27a.

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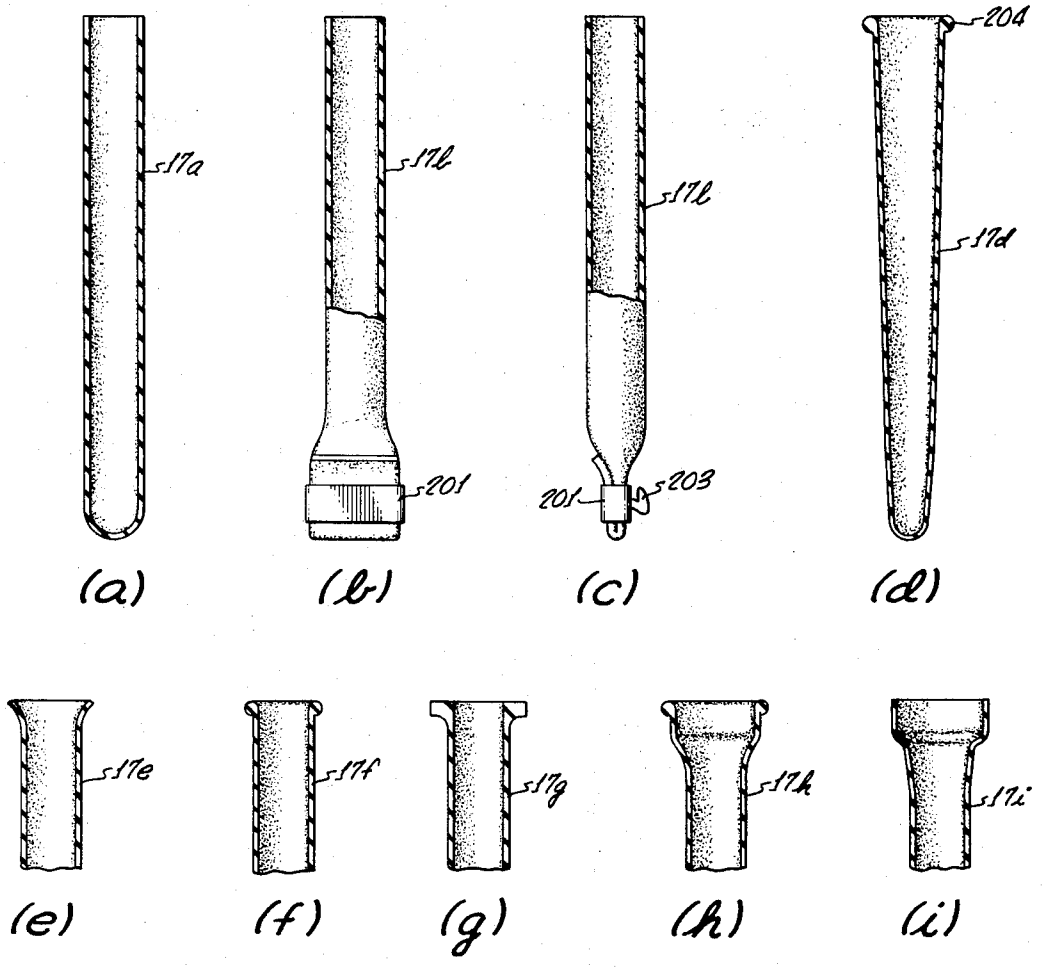

FIG. 28.

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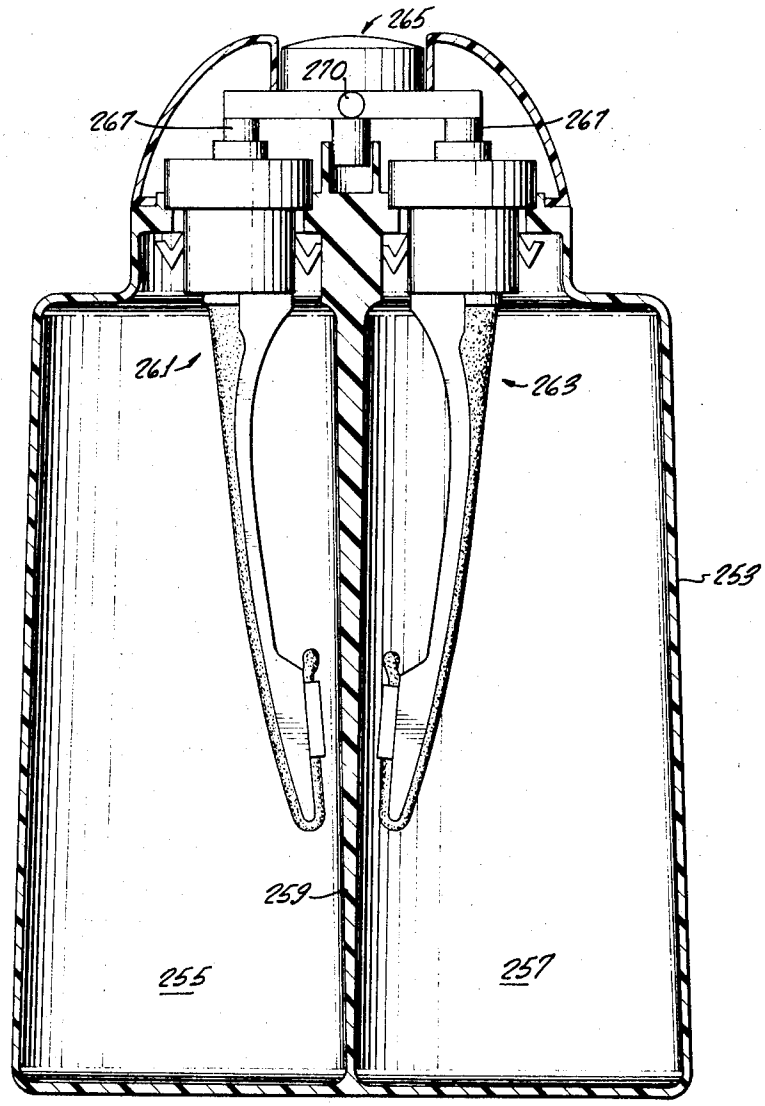

FIG. 29.

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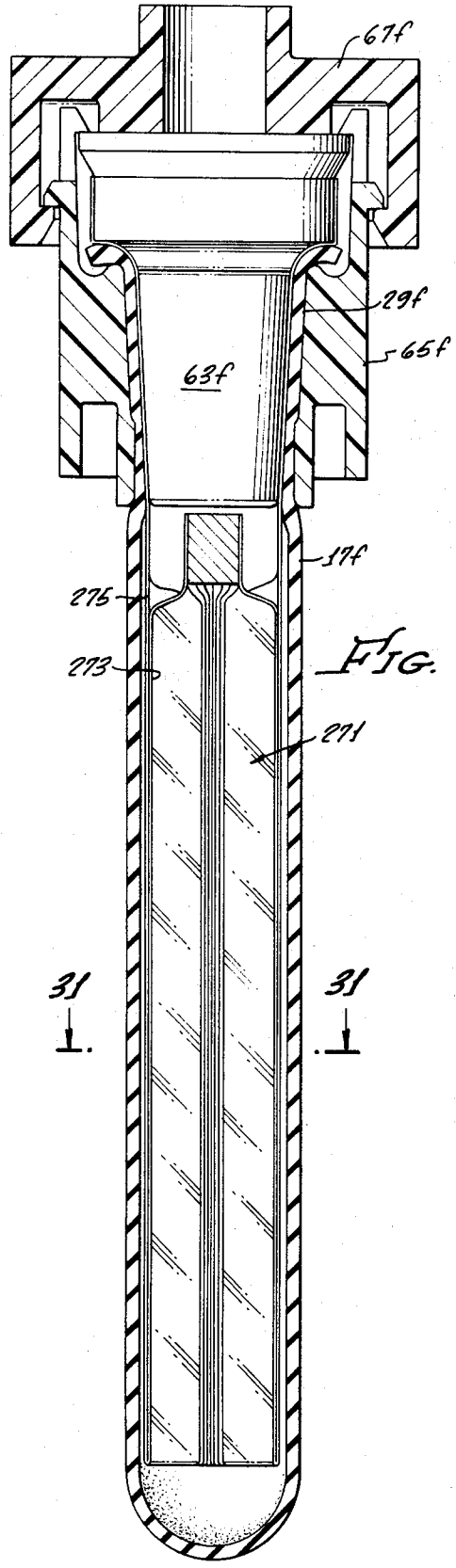

FIG. 30.

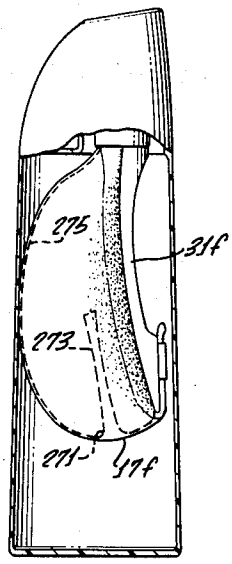

FIG. 33a.

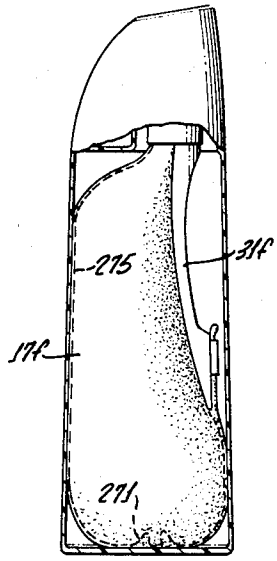

FIG. 33b.

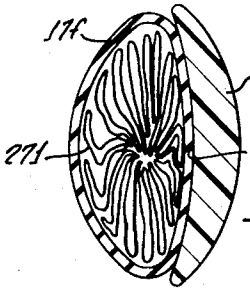

FIG. 32.

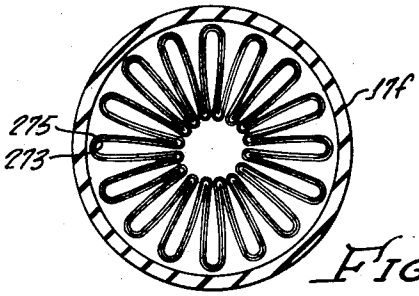

FIG. 31.

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BLADDER TYPE DISPENSER

The present invention relates generally to pressurized fluid dispensers and more specifically to a dispenser in which the required pressure is provided by a resilient bladder which expands elastically when it reaches its contents and which then contracts to expel those contents. In order to insure that the bladder will expel practically all of its contents, it is prestressed over a surface in such a manner that its opposing walls continue to press toward one another even when the bladder is empty.

A pressurized dispenser of this type is disclosed and claimed in U.S. Pat. No. 3,506,005. The present inventors are also two of the inventors of this patent. In one embodiment of the patented dispenser, a cylindrical mandrel extends from the floor of the dispenser body toward its top, where a valve assembly is seated. A resilient bladder which is closed at one end and open at the opposite end is attached at its open end to the valve assembly and is prestressed by being pulled over the mandrel. This is done by pressing the tip of the mandrel against the closed end of the cylindrical bladder so as to fold the closed end of the bladder back into itself. In this way the mandrel not only pushed the bottom portion of the bladder back into the top portion, but it also stretches both portions of the bladder radially outwardly and against one another. This manner of prestressing a bladder requires that the prestressing mandrel be aligned carefully with the tubular bladder.

An improved pressurized dispenser utilizing a prestretched bladder is disclosed in Patent application Ser. No. 887,189 filed by the inventors of the present invention on Dec. 22, 1969. In the improved dispenser the mandrel is tapered from its base toward its tip and the closed end of the bladder is formed by a disk-like membrane which is capable of flexing between a concave position and a convex position when the tip of the mandrel is pressed against it, thereby helping to align the membrane with the mandrel. Both the provision of the flexible membrane and the tapered mendrel help to ease the assembly of the mandrel into the bladder.

In accordance with an important feature of the present invention the bladder is prestressed longitudinally rather than radially in such a manner that this prestressing can be achieved before the final assembly of the pressurized container. More particularly, there is provided for final assembly into a substantially rigid outer container a preassembled inner pressurized capsule which includes a valve assembly, an elongated prestressing member which extends from the valve assembly, and a resilient bladder which is stretched longitudinally along the prestressing member with its inlet end being anchored in the valve assembly and its opposite, closed end being attached to the prestressing member. After the capsule has been assembled, it may then be inserted into an opening in the outer container in which it may be anchored by any one of a number of alternative means, preferred ones of which are disclosed herein.

Normally, with the pressurized capsule in place in the container, the prestressing member extends generally parallel to the wall of the container and stops short of its base. This arrangement has several advantages. First, since the bladder expands asymmetrically relative to the supporting member the capsule need not be axially mounted in the container. And, for the same reason, the container can take various shapes. Second,

since the bladder is stretched longitudinally to lie flat on the supporting member, it tends to expand evenly as it is filled, without localized bulging. Third, by mounting the supporting member near one wall sector and well above the base of the container, the bladder is given more room to expand before hitting any portion thereof. As a result, the bladder receives most of its contents before abutting against the container, thus reducing the ultimate pressure exerted by the filled bladder against the container. A fourth advantage of the pressurized capsule concept, wherein a bladder is stretched longitudinally upon a support member, is that the amount of pressure exerted by the bladder upon its contents can be readily changed by increasing or reducing the extent by which the bladder is elongated longitudinally in its stretched condition. Thus, fluids of different consistency can be accommodated without changing the dimensions of either the bladder or of the supporting member upon which it is stretched.

In accordance with a related feature of the present invention, the pressurized capsule is made sufficiently versatile to permit its use both in an upright container, in which the valve assembly is in an end wall of the container, and in a normally supine container, in which the valve assembly enters the outer container through an upwardly facing side wall. In carrying out this aspect of the invention, the prestressing member, which is typically in the shape of a rib or a spoon, is bendable relative to the valve assembly so that it can be inserted through the side wall of the horizontal type of dispenser and, once inserted, can be bent so as to move toward the bottom wall of the container.

Another related feature of the present invention, which is not necessarily limited to use with a preassembled capsule type of dispenser, is the provision of a flexible bag liner inside the resilient bladder. The combination of a flexible bag and the resilient bladder around it is particularly useful in instances where the bladder is to receive a fluid which might damage the bladder or which might in turn be spoiled thereby. In such cases, the bag insert can be chosen to be compatible with the fluid which is to be dispensed, without having the resilience which is required of the bladder to expel all of its contents. In other words, in the case of a fluid which is difficult to handle, a single material need not have both the mechanical characteristics required of the bladder and the chemical characteristics required to be compatible with the contents of the bladder. To the contrary, a common bladder material can be used with all fluids, with a bag insert being used in case of those incompatible with it. In accordance with this feature of the invention, the bag insert is made to be larger when it is filled than the bladder when it is contracted. The bag is folded before insertion into the bladder and is unfolded and thus increases in size as the fluid is injected into the bag, which in turn causes the bladder to stretch and thus expand.

Also disclosed herein is a novel manner of anchoring the bladder in the valve assembly. In accordance with this feature of the invention, the valve assembly includes a pair of cylindrical gland members which between them define an annular space in which the inelt end of the bladder is held clamped. The outer gland member is locked into the container and the inner gland member contains a valved passage through which fluid enters into and is discharged from the bladder. Advantageously, the prestressing rib member is an-

chored in a slot provided for that purpose in the outer gland member.

The pressurized capsule of the present invention lends itself to use either individually, that is one container per capsule, or in combination with one or more similar capsules. Thus, there is disclosed herein a multiple chamber container in which each chamber contains its individual pressurized capsule. All of the capsules expel their contents through a single valve assembly which may either intermix their contents during the discharging process or alternatively may keep their contents segregated by means of individual discharge orifices. The pressurized capsule concept makes this type of multi-chamber container quite practical since the entire multi-capsule assembly can be preassembled prior to insertion into the multi-chamber container.

The present invention and its advantages will be more clearly understood with reference to the following description of several embodiments thereof taken in conjunction with the accompanying drawings wherein:

FIG. **1** is a cross section through an exemplary upright pressurized dispenser in which a bladder is stretched longitudinally along a supporting member or rib which is rigidly anchored in a valve assembly to which the neck of the bladder is also attached, the bladder being shown in profile in its empty state;

FIG. **2** is a cross section of the dispenser illustrated in FIG. **1** showing the bladder in plan view in its empty state;

FIG. **3** is a cross section similar to FIG. **1** but with the bladder shown in a partially filled state;

FIG. **4** is a cross section similar to FIG. **3** but with the bladder being shown in its filled state;

FIGS. **5, 6,** and **7** illustrate different container shapes and capsule locations made possible by the present invention;

FIG. **8** is a cross section through a pressurized dispenser which is normally supine and in which the pressurized capsule features a hinged support member to facilitate insertion of the capsule into the container;

FIG. **9** is a cross section similar to FIG. **8** but with the bladder shown in its filled state and with the hinged supporting member shown displaced from its original position by the filled bladder;

FIG. **10** is an end view of the dispenser illustrated in FIGS. **8** and **9** to illustrate its cross section;

FIG. **11** is an exploded perspective view of the hinge portion of the support member illustrated in FIGS. **8** and **9**;

FIG. **12** is a side view of the hinge assembly shown in FIG. **11** with the support member shown in its erect position upon the valve assembly to which it is hinged;

FIG. **13** illustrates an upright container basically like those illustrated in FIGS. **1–4** but with an actuator having a built in lock to prevent inadvertent discharging of the bladder;

FIG. **14** is a detailed cross section through a dispenser assembly including a valve assembly and an actuator therefor and characterized by the fact that the valve assembly has a pair of gland members which clamp the neck of the bladder between them and which are in turn held together by means of a locking cap;

FIG. **15** is an exploded perspective view of the valve and actuator assembly shown in cross section in FIG. **14**;

FIG. **16** is a cross section through an alternative type of dispenser assembly characterized by the fact that it too includes a pair of gland members which clamp the neck of the bladder between them, but which interlock without the aid of a separate locking cap, thus permitting the bladder to be filled prior to the insertion of the valve mechanism into the valve assembly;

FIG. **17** is an exploded perspective view of the base of the support member and of the bottom portion of the outer gland member of the valve assembly to show the manner in which they interfit;

FIGS. **18***a–18d* illustrate different alternate cross sections for the bladder support member shown in FIG. **16**;

FIG. **19** is an exploded perspective view of an actuator cap of the type shown in cross section in FIG. **13**, particularly illustrating its stop elements;

FIG. **20** is an exploded perspective of a valve assembly and of the root portion of an alternative type of bladder support member which is characterized by the fact that the support member extends transversely relative to the principal axis of the valve assembly;

FIG. **21** is a side view showing a valve assembly in which a bladder support member is flexibly anchored so as to permit it to assume both an erect position, shown in solid lines, in which it extends generally parallel to the axis of the valve assembly and a second position, shown in dotted lines, in which the support member extends transversely relative to the principal axis of the valve assembly;

FIG. **22** is an exploded perspectve view of the valve assembly and bladder support member illustrated in FIG. **21**;

FIGS. **23** and **23***a* illustrate in cross section one manner of anchoring an end of the bladder upon the bladder support member, featuring a clip in which the end of the bladder is crimped and which is provided with a button-type fastener anchored in a slot provided or that purpose in the bladder support member;

FIGS. **24** and **24***a* illustrate in cross section and in exploded perspective view a method of anchoring the bladder upon the bladder support member wherein the terminal portion of the bladder is locked between the bladder support member and a clip, with the clip having a plunger which crimps the bladder into an opening in the bladder support member;

FIGS. **25** and **25***a* are cross sections through yet another type of bladder and bladder support member wherein the bladder is attached to the bladder support member by means of a crimp-type fastener having an integral extension which snaps into a slot provided in the end of the bladder support member;

FIGS. **26** and **26***a* show in plan view and cross section an embodiment in which the bladder terminates in a tab having a beaded end by means of which the bladder is anchored in a slot provided near the tip of the bladder support member;

FIGS. **27** and **27***a* illustrate in plan view and cross section yet another alternative embodiment in which the bladder has a tab at its end with a hole therethrough, the bladder being attached to the bladder support member by means of a hollow rivet which extends through the hole in the tab into a countersunk hole in the support member;

FIGS. **28***a–28s* show alternative configurations which the bladder may assume;

FIG. 29 is a cross section through a multiple chamber container in which each chamber contains an individual pressurized capsule;

FIG. 30 illustrates in cross section an exemplary pressurized capsule wherein the resilient bladder contains a folded bag as a liner, the cross section being taken before the bladder has been stretched upon its associated support member;

FIG. 31 is a cross section taken along line 31—31 of FIG. 30 showing the shape of the radially accordion folded bag within the bladder before the latter has been stretched;

FIG. 32 is a cross section similar to FIG. 31, but taken after the bladder has been stretched, and showing its walls flattened and the folded bag between them compressed; and

FIGS. 33*a* and 33*b* are cross sections through an exemplary upright dispenser utilizing the bladder-bag combination of FIGS. 30–32 and showing them in the partially and fully expanded states.

Referring to FIGS. 1–4, an exemplary embodiment of the present invention is illustrated in the form of an upright pressurized dispenser 11 whose principal components are an outer container 13 and a pressurized capsule 15 mounted rigidly therein. The pressurized capsule 15 includes an elongate resilient bladder 17 having wall means 19 defining a fluid chamber 21 interior of the bladder and a fluid outlet 23 in communication with the interior of the bladder. The capsule 15 also includes, as a principal element, a rigid elongate member defining a support surface 25 exterior of the bladder 17 against which the bladder is stretched longitudinally so as to maintain the bladder wall means 19 in tension and the bladder 17 substantially empty in its contracted position, which is illustrated in FIG. 1. In the exemplary embodiment shown in FIGS. 1–4 the elongate bladder 17 is sausage-shaped, being closed at one end 27 and having an open neck 29 (better shown in FIG. 16).

The elongate support surface 25 along which the bladder 17 is stretched is preferably defined by a generally spoon-shaped or spatulate rib 31, which is slightly arched so as to give the support surface 25 a longitudinally convex configuration. In accordance with the invention, the closed bladder end 27 is attached to the tip 33 of the spatulate rib 31, this attachment preferably being by means of a clip 35, the tip 33 of the rib being thickened in order to provide room for means to receive the clip 35. In further keeping with the invention, the opposite end, or neck 29 of the bladder 17, as well as the base 37 of the rib 31, are anchored in a valve assembly 39 which in turn is mounted in a raised neck portion 41 extending from an end wall 43 of the container 13. As will be described in greater detail hereinafter, the valve assembly 39 includes a valved passage which is normally blocked and which is in communication with the bladder outlet 23. Seated in the valve assembly 39 is an actuator 45 having a hollow plunger 47 which extends into the valve assembly 39 and which serves to open its valved passage. The actuator 45 is better shown and will be described in greater detail with reference to FIG. 14. Suffice it to say at this point that it contains a passage through which fluid flows when the valved passage of the valve assembly 39 in unblocked. Partly for aesthetic purposes and partly to prevent the actuator 45 from being dislodged, a protective cap 48 is snapped around the end wall 43 of the container 13, the cap having a generally circular opening 49 through its top to provide clearance for the central portion of the actuator 45 and having a slot through its side to provide clearance for the dispensing spout 51 of the actuator.

The bladder 17, which is preferably made of an elastomeric material, is shown partially filled in FIG. 3 and in a substantially filled state in FIG. 4. Typically, filling is accomplished by injecting the desired contents of the bladder 17 under pressure through the valve assembly 39, with its actuator 45 removed. The amount of pressure required will depend upon the contractive force of the bladder, a factor which is determined by the bladder wall thickness and the extent to which the bladder is elongated upon the rib 31 from its normally unstretched condition. As the bladder 17 receives its contents and expands, it will displace the air normally residing in the container 13 so that provision is made for the escape of such air, this being preferably by providing sufficient clearance for this purpose between the container neck portion 41 and the valve assembly 39 seated therein.

Referring particularly to FIGS. 3 and 4, it may be observed that, as the bladder receives its contents it expands both laterally, principally away from the supporting surface 25 toward the wall sector 53 opposite the support surface 25, and downwardly toward the container bottom 55. The important point to note is that the expansion of the bladder laterally and downward is substantially even and that there is no untoward bulging or ballooning of any particular portion of the bladder wall 19.

After the pressurized dispenser 11 has been filled, the actuator 45 is installed in the valve assembly 39 and the protective cap 48 is snapped in place. In this condition the dispenser 11 may be stored for subsequent use. The contents of the bladder 17 are prevented from escaping through the valve assembly 39 due to the normally blocked state of its valved passage. When it is desired to withdraw some or all of the contents of the dispenser 11, the actuator 45 is depressed, thereby unblocking the valved passage in the assembly 39. This permits the fluid contents of the bladder 17 to be expelled under the contractive force of the bladder wall 19. If the actuator 45 is held depressed long enough or often enough, the bladder 17 will eventually return to its initial state shown in FIG. 1 because of its initially longitudinally stretched condition in which it is held upon the supporting rib 31. In this way the waste attendant to substantially less than all of the bladder contents being expelled is eliminated.

FIGS, 5, 6, and 7 show some of the variations in the configurations of the container 13 which are made possible by the pressurized capsule concept illustrated in FIGS. 1–4. In FIG. 5 the container is shown to be circular in cross section and the pressurized capsule 15, as indicated by its actuator 45, is shown to be alternatively positioned either axially, in solid lines, or away from the axis of the container, in dashed lines. In FIG. 6, axial and offset locations for the pressurized capsule 15 are shown with reference to a container 13 having an oval cross section, and a generally rectangularly cross sectioned container 13 is illustrated with three alternative pressurized capsule locations in FIG. 7. This flexibility in container configuration and in capsule location is made possible by the fact that the bladder 17 expands asymmetrically with reference to the supporting rib 31 so that the supporting rib can be easily offset toward a

wall sector of a container and the bladder 17 will still be able to expand properly toward the opposite wall sectors of the container, ultimately conforming thereto.

Referring next to FIGS. 14, 15 and 16, two alternative constructions fo the valve assembly 39 will be described next. Generally, the valve assembly shown in FIGS. 14 and 15 is intended for situations where the bladder 17 is to receive its contents through the completed valve assembly 39. On the other hand, the alternative valve embodiment shown in FIG. 16 makes possible the filling of the bladder 17 through the valve assembly prior to its completion which, as will be seen later, permits the filling to occur more quickly.

Referring specifically to FIGS. 14 and 15, the valve assembly 39 illustrated there is comprised of an inner gland 63 and an outer gland 65 held together by a locking cap 67 and clamping between them the neck 29 of the bladder 17. The remaining principal parts of the valve assembly 39 are a valve stem 69, a valve seat gasket 71 on the valve stem 69, and a valve spring 73 compressed between the valve stem 69 and the inner gland 63. The inner gland 63 has a slightly tapered cylindrical outer wall 75 onto which the tubular open end, or neck 29 of the bladder 17 is pushed. The tapered wall 75 terminates in an outwardly flared peripheral surface 77 and the bladder neck 29 is pushed up on the tapered gland surface 75 until it rides out onto the peripheral surface 77. With the bladder neck 29 in this position the outer gland 65 is moved axially along the bladder 17 until it is in the position shown in FIG. 14 in which a slightly tapered inner wall 79 of the outer gland 65 is opposite the tapered outer wall 75 of the inner gland 63. In this position the inner and outer glands 63 and 65 clamp the bladder neck 29 between them, thereby producing a tight and sealing fit. The bladder neck 29 is further secured by a pinching ring action produced by a peripheral convex rim 81 which is at the upper end of the tapered inner wall 79 and which is opposite the flared inner gland surface 77. Just outside the peripheral rim 81 the gland member has a peripheral well portion 83 so as to provide room for alternative bladder neck configurations, wherein the extreme end of the bladder is provided with a bead for even more secure anchoring thereof. Examples of such beaded bladder necks appear in FIG. 28.

Having assembled the inner and outer glands 63 and 65 with the bladder neck 29 between them, the next step is to insert the valve spring 73 inside the inner gland 63 wherein it is supported by a set of radially inwardly extending remaining fingers 85. Seated on top of the valve spring 73 is the valve stem 69 which is held centered in the valve spring 73 by means of an axially extending seating guide 87. The valve stem 69 includes in addition to the guide 87, a valve disk 89 having fingers 90 extending radially therefrom to hold it in place against the force of the spring 73, and a slotted cylindrical stem which is illustrated as being comprised of a set of prongs 91. The valve seat gasket 71 which is preferably made of an elastomeric material and which is essentially right cylindrical with a cylindrical inner surface 93, may be mounted upon the valve stem 69 prior to its assembly into the inner gland 63, with the inner surface 93 of the gasket 71 fitting snugly but axially slideably upon the valve stem prongs 91.

At its upper end the inner gland 63 has a peripheral, radially outwardly extending ledge or rim 95 having an inner cylindrical surface 97 terminating at its bottom in a radially inwardly extending narrow ledge 99. Seated in the space within the rim 95 and defined by the surfaces 97 and 99 is the valve seat gasket 71. The gasket has a cylindrical outer surface 101 which is dimensioned to provide a press fit against the gland inner surface 97 and to be restrained against axial movement toward the bottom of the inner gland 63 by the ledge surface 99.

The next element to be added to the assembly is the locking cap 67 which is principally comprised of a disk 103 having a peripheral rim 105 from which a plurality of flexible locking fingers 107 depend. The locking fingers 107 include a beam portion 109 which is capable of flexing radially outwardly and which terminates in a locking tip 111. Collaborating with the locking fingers 107 is a tapered rim 113 at the top of the outer gland 65. The outer gland upper rim 113 and the locking cap finger tips 111 are provided with cooperating cam surfaces 115 and 117 respectively. When the locking cap 71 is pushed axially onto the outer gland 65, the camming surfaces 117 ride axially along the camming surfaces 115 forcing the fingers 107 radially outwardly until the finger tips 111 pass the bottom of the outer gland upper rim 113 at which point the fingers snap radially inwardly and lock the cap upon the gland 65.

After the construction of the valve assembly 39 has progressed to the stage just described, normally the next step is to attach the closed end 27 of the bladder 17 to the tip 33 of the supporting rib 31 and to insert the base 37 of the supporting rib into the valve assembly 39. Since this aspect of the pressurized container 11 forms an important part of the invention, it will be described in greater detail hereinafter. Let it be assumed for purposes of the present description that this step has been accomplished. With the bladder 17 and the supporting rib 31 in place, the next step is to insert the valve assembly 39, with the supporting rib 31 extending downwardly therefrom as seen in FIG. 1, into the container neck 41. Two means for securing the valve assembly 39 in the container neck 41 are illustrated in FIG. 14. The first means includes a set of flexible fingers 119 which are integral with the outer gland 65 and which extend radially outwardly from the outer cylindrical surface 121 thereof. The fingers 119 include outwardly angled flexible shanks 123 terminating in stop surfaces 125 which are generally parallel to the underside of the end wall 43 of the container 13. The peripheral surfaces 127 of the outer gland retaining finers 119 are axially tapered so as to present camming surfaces whereby the fingers 119 are compressed radially as the valve assembly 39 is pushed through the opening in the end wall 43. Once the fingers 119 and in particular their camming surfaces 126 have cleared the end wall 43 they snap radially outwardly and retain the valve assembly 39 in the end wall 43, with the finger stop surfaces 125 preventing radial movement of the valve assembly relative to the end wall.

A second, and alternative, means for securing the valve assembly 39 is shown in dashed lines in FIG. 14 as a set of flexible retaining fingers 140 extending upwardly from the container end wall 43 as having radially inwardly extending tips 142 which hold the valve assembly 39 captive.

Once the valve assembly 39 has been installed in the container 13, the unit is ready to receive its fluid content. With the type of valve assembly llustrated in FIG. 14 this is done by utilizing the valving action of the

valve stem **69** and the valve seat gasket **71.** In particular, filling of the bladder **17** takes place through a cylindrical axial opening **127** in the locking cap **67.** As seen in FIG. **14,** the valve stem prongs **91** bear not only against the gasket **71** but also are seated in the locking cap opening **127** with which they are in sliding engagement. Normally the components of the valve assembly **39** define a valved passage which extends through the inner gland **63** and through the locking cap opening **127,** which passage is blocked by the combined action of the gasket **71** and the valve stem **69.** The blocking of the passage **129** is accomplished by the intimate engagement of the convex peripheral upper edge **131** of the valve stem disk **89** and of the abutting bottom inner corner **133** of the gasket **71** which is deformed by the surface **131** into a peripheral concave configuration. The passage **129** is unblocked by moving the valve stem **69** axially relative to the remaining parts of the valve assembly **39,** typically by inserting a hollow plunger into the cap opening **127** so as to press against the valve stem prongs **91.** When this happens, the valve stem convex surface **131** separates from the gasket corner **133** and fluid is allowed to flow from the bottom portion of the valved passage **129** between the normally abutting peripheral surfaces **131** and **133** and between the valve stem prongs **91** out through the upper portion of the valved passage **129,** defined by the locking cap axial opening **127.** The valve assembly **39** is returned to its locked state by releasing axial pressure from the valve stem **69,** whose disk **89** is promptly returned by the valve spring **73** into sealing engagement with the gasket **71.**

Thus, to fill the bladder **17** through the valve assembly **39** a filling spigot (not shown) is normally inserted through the cap opening **127** so as to depress the valve stem **69** and fluid is then fed under pressure through the valve assembly **39** into the bladder **17.** When the bladder **17** has received its desired contents and has sufficiently expanded to accommodate such contents, the filling spigot is lifted out of the valve assembly **39** and the filling step is considered complete. All that remains is to snap the actuator **45** into place. The actuator **45** illustrated in FIG. **14** is slightly different from that shown in FIGS. **1–4.** It is comprised of a cap portion **135** having a skirt **137** riding on the neck **41** of the container **13** so as to guide the actuator **45** between its released and depressed states and an axially extending tubular plunger **139** which is received in the locking cap opening **127.** The plunger **139** has a passage **141** therein which is continued through a radially extending spout **143.** When the actuator **45** is depressed toward the container **13,** its plunger **139** unseats the valve stem **69,** opens the passage **129,** and allows fluid to be discharged through the actuator passage **141.**

Turning now to the manner in which the supporting member **31** is rigidly anchored in the valve assembly **39,** in the preferred embodiment of the invention, as best shown in FIG. **17,** the member **31** assumes an arcuate shape at its base extending over approximately 180° of arc. Extending from the base of the support member **31** is an arcuate tongue **145** approximately bisected by a slot **147.** Cooperating with the tongue **145** is an annular groove **149** formed by a pair of concentric cylindrical walls **151** and **153** at the base of the outer gland **65.** A set of ribs **155** connect the inner and outer gland wall members **151** and **153** across the annular groove **149.** The width of the annular groove **149** is designed so as to assure that it will grab tightly the arcuate tongue **145** at the base of the support member **31.** Similarly, the ribs **155** have a thickness designed to cause them to be tightly engaged with the slot **147** between the segmented halves of the arcuate tongue **145.** The purpose of the particular mounting arrangement illustrated in FIG. **17** is to permit the support member **31** to be mounted ithe outer gland **65** in any one of four different positions spaced 90° apart, a flexibility in design which has advantages in certain applications.

FIG. **16** shows an alternative arrangement for the valve assembly **39.** The alternative valve assembly of FIG. **16** includes the same principal elements as those contained in the valve assembly of FIG. **14** and are identified with the same reference numerals, but with the suffix *a* added for clarity. The basic difference between the valve assemblies of FIGS. **14** and **16** is in the manner in which they are held together. The valve assembly of FIG. **14** is held together by the locking cap **67** which interlocks with the outer gland member **65,** capturing the remaining elements of the valve assembly **39** between them. In contrast, the inner and outer gland members **63***a* and **65***a* of the valve assembly **39** in FIG. **16** interlock without the aid of the locking cap **71***a,* which permits them to secure the bladder neck **29** between them before the valve stem **69,** the valve spring **73** and the valve gasket **71** have been installed. This in turn has the advantage of permitting fluid to be injected through the inner gland member **63a** into the bladder **17** without interference by the aforementioned valve elements, and hence more quickly.

Turning more specifically to the elements of the modified valve assembly of FIG. **16,** the inner gland member **63***a* is provided at its upper end with an outwardly flaring peripheral cam surface **157.** Cooperating with the cam surface **157** are a set of locking fingers **159** which extend upwardly from the rim of the outer gland members **65***a.* The locking fingers **159** terminate in radially inwardly pointed tips **161** having inwardly sloping cam surfaces **163.** The locking fingers **159** are flexible and bend radially outwardly as the outer gland **65***a* is pushed onto the inner gland **63***a,* the bladder neck **29** first having been pulled onto the inner gland **63***a,* with the inner gland cam surface **157** bearing against the outer gland finger cam surfaces **163.** When the outer gland finger tips **161** pass above the top of the inner gland **63***a,* the locking fingers **159** snap back radially inwardly securely to capture the inner gland **63***a* inside the outer gland **65***a.*

With the outer gland **65***a* locked around the inner gland **63***a* and with the bladder neck **29** clamped between them, the assembly shown in FIG. **16** may be pressed into the end wall **43** of the container **13** (FIG. **1**) in preparation for filling of the bladder **17.** One effective way of accomplishing this is to apply a vacuum between the inner walls of the outer container **13** and the wall **19** of the bladder **17.** The bladder wall thickness may be designed for this purpose to be such that the atmospheric pressure inside the bladder is capable of inflating the bladder **17** to its ultimate size which is typically the fully inflated state shown in FIG. **4.** In certain instances where it is desired that the bladder **17** be expanded with greater force than that made possible by the pressure differential between simple atmospheric pressure inside the bladder and a near vacuum in the space between the bladder and the container **13,** an ambient pressure which is greater than atmospheric

may be maintained in the space where the pressurized container **11** is being filled.

After the bladder **17** has been inflated by the pressure differential created between the inside of the bladder and the space between the bladder and the container wall, the substance to be filled is injected into the bladder through the inner gland **63***a* as if an open bottle were being filled, since the bladder will typically adhere to the wall of the container. Once filling has been accomplished, the pressure differential must be maintained until the remaining valve elements have been installed. This is so since the bladder **17** is now stretched and if the pressure differential were released, the bladder would contract and would expel its contents. Therefore, while the pressure differential is still maintained, the valve spring **73***a*, the valve stem **69***a* and the gasket **71***a* are installed inside the inner gland **63***a* after which the locking cap **67***a* is snapped in place. It will be noted from FIG. **16** that the locking cap **67***a* has the same type of locking fingers **107***a* as its counterpart in FIG. **14** and that it engages with the rim of the outer gland **65** *a* in the same manner as explained with reference to FIGS. **14** and **15.** There is shown in FIG. **16** an optional additional element which is a securing ring **165** that can be slipped around the locking fingers **107***a* to prevent them from accidentally spreading apart.

FIGS. **13** and **19** illustrate an alternative design for the actuator **45** and the locking cap **67** illustrated in FIG. **15.** Basically, the actuator, labeled **45***b* and locking cap labeled **67***b*, include a pair of stop surfaces **167** and **169.** As in FIG. **14,** the actuator **45***b* of FIGS. **13** and **19** has a hollow plunger **139***b* which is slideably disposed in the axial passage **127***b* housing the valve stem **69** (not shown in FIGS. **13** and **19**). As explained before, when the actuator **45***b* is depressed, the plunger **139***b* slides down in the axial valve passage **127***b* so as to unseat the valve stem **69.** The actuator **45***b* is rotatable upon the locking cap **67***b*, with the stop surfaces **167** and **169** abutting one another when the actuator is rotated to a particular position (shown by dashed lines in FIG. **13**) so as to prevent the actuator from being depressed. In particular, the surfaces **167** and **169** are formed by radially extending tabs, one of which depends from the actuator **45***b*, and the other of which rises from the top surface of the locking cap **67***b*. A pair of detents **171** and **173** are located on the tabs **167** and **169** and they interlock so as to yieldably resist the actuator **45***b* from rotating out of its locked position once placed therein.

In assembling the bladder **17** and the support member **31** to the valve assembly **39,** the first step is to clamp the bladder neck **29** between the inner and outer gland members **63** and **65** either as explained with reference to FIG. **14** or as outlined in connection with FIG. **16.** Then the opposite or closed end **27** of the bladder **17** is attached to the tip **33** of the supporting rib **31.** Finally, the arcuate tongue **145** at the base of the support member **31** is slipped into the annular groove **149** at the base of the outer gland **65.** The length of the bladder **17** relative to that of the supporting rib **31** is designed so as to place the bladder **17** in tension along its length. In this state one of its walls **17***a* (FIG. **16**) lies flat against the support surface **25** of the support member **31,** while its opposite wall **17***b* is constrained to lie flat against its first wall **17***a* along the length of the bladder except for the area near the base of the support member **31.** As a result, the bladder tends to be empty throughout its length except for a small volume **175** just below the bladder neck **29.** The support surface **25** presented by the support member **31** changes from a generally semi-circular concave area near the base of the support member to one which is only slightly curved and which may be either convex with tapered edges (FIG. **18***a*), convex with flat edges (FIG. **18***b*), straight (FIG. **18***c*), or concave (FIG. **18***d*). These last four possible cross sections are merely illustrative of the variations in cross section which are possible.

The particular bladder support member **31** to which reference has been made thus far is best suited for use in upright containers such as that shown in FIGS. **1–4.** this type of support member **31** may extend either parallel to the axis of the valve assembly **39,** as shown in FIG. **16,** or at a slight angle, as illustrated in FIG. **14.** Alternatively, however, instead of extending substantially directly away from the valve assembly **39,** the support member **31** may also extend transversely therefrom as shown in FIG. **20.** In that figure, there is shown a modified valve assembly **39***c* having a locking cap **67***c* similar to that illustrated in FIG. **14** and an outer gland **65***c* having an arcuate slot **177** in its side terminating in a pair of semi-circular depressions **179.** Also illustrated is a modified bladder support member **31***c* whose stem terminates in an arcuate collar **181** having enlarged ends **183** designed to fit into the depressions **179.** The arcuate collar **181** is sufficiently flexible to permit it to be snapped into the slot **177** with the depressions **179** in the gland **65***c* being spaced slightly farther apart than the enlarged ends **183** so that they snap into place only after the collar **181** has been slightly deformed, after which the ends **183** snap in place and the support member **31***c* is held rigidly in place upon the valve assembly **39***c*.

The embodiment shown in FIG. **20** is suitable for use in containers of the type shown in FIGS. **8, 9,** and **10** wherein the container is normally supine, that is it lies on its side and in which the valve assembly extends from the upper side of the container. Alternative designs suitable for use with this type of container are shown in FIGS. **21** and **22** and in FIGS. **11** and **12.** Basically, these alternative designs feature a bladder support member **31** which is mounted flexibly relative to the valve assembly **39** so that it is capable of extending both axially and laterally therefrom. The simplest of the two alternatives is shown in FIGS. **21** and **22** and includes a tab **185** which extends from the arcuate base of the bladder support member **31***d*. A set of slots **186** are distributed peripherally along the bottom of the outer gland **65***d* and are designed snugly to receive the tab **185.**

Just as in the case of the mounting arrangement shown in FIG. **17,** the bladder support member **31d** shown in FIGS. **21** and **22** can be installed in nay of several alternative positions, depending upon the slot **186** into which the tab **185** is inserted. Once in place in the outer gland **65***d*, the support member **31***d* tends naturally to extend axially therefrom. Moreover, it tends to remain in this erect position due to the pull of the bladder **17** which is stretched along its support surface **25***d*. The support member **31***d* may be left in this position if it is desired to use the assembly in an upright container such as that shown in FIGS. **1–4.** On the other hand, if it is desired to use it in a horizontally disposed container such as that shown in FIGS. **8–10,** then the sup-

port member 31*d* would be flexed during the process of the valve assembly 39*d* being installed into the opening provided for it in the side of the container, as indicated in dotted lines in FIG. 21.

The second alternative for providing a valve support member which can be used in a horizontally disposed container is to mount the support member upon the valve assembly by means of a hinge. As best shown in FIGS. 8–12, a supine dispenser featuring a hinged support member 31*e* includes a container 13*e* having a flat bottom wall and a flat top wall having a slightly thickened portion 43*e* supporting a raised neck 41*e*. A valve assembly 39*e* is seated in the wall portion 43*e* in the neck 41*e*. The hinged bladder support member 31*e* best shown in FIGS. 11 and 12 includes a flat neck 187 having a pair of spaced apart hinge members 189 thereon. The valve assembly 39*e* includes, as in the other embodiments, a locking cap 67*e* and an outer gland member 65*e*, the latter having a single hinge member 191 dimensioned to fit between the hinge members 189. With the hinges 189 and 191 aligned, a hinge pin 193 is inserted into them, thus completing the hinged attachment of the support member 31 *e* to the valve assembly 39*e*.

It will be understood that the completion o the hinge will occur after the bladder neck 29 has been clamped into the bladder assembly 39*e* and after the closed end 27 of the bladder 17 has been attached to the end 33*e* of the support member 31*e*.

As in the case of the support member 31*d* shown in FIGS. 21 and 22, the contractive force of the bladde will tend to pull the support member 31*e* into an erect position in which it extends axially away from the valve assembly 39*e*. A pair of stop surfaces 195 at the upper end of the support member 31*e* serve to determine the erect position of the support member, these stop surfaces bearing against the bottom surface 197 of the outer gland 65*e*. In this position the combination of the valve assembly 39*e*, the bladder 17 and the bladder support member 31*e* can be used in an upright container such as that shown in FIGS. 1–4. Primarily, however, they are intended to be used with the support member 31*e* bent at an angle with the axis of the valve assembly 39*e* as shown in FIGS. 8 and 9. After the bladder 17 has been attached to the support member 31*e* and the latter has been hinged to the valve assembly 39*e* the support member 31*e* with the bladder 17 stretched thereupon is inserted through the opening in the thickened wall portion 43*e* and upon meeting the bottom of the container 13*e* is bent thereby into the position shown in FIG. 8. Upon inflation of the bladder 17 (either due to a pressure differential achieved by a vacuum between it and the container 13*e*, or as a result of receiving its ultimate contents), the inflated bladder lifts the support member 31*e* away from the surface of the container 13*e* and toward its top. If desired, a stop surface 198 may be provided by means of a tongue 199 which extends from between the hinge members 189 substantially parallel to the stop surfaces 195. The tongue 199 would serve to determine the extreme raised position of the support member 31*e* by bearing against the outside of the outer gland 65*e*.

The bladder 17, while usually generally elongated in shape, may vary in other details. Some of these variations are illustrated in FIG. 28.

The simplest form of bladder is that illustrated in FIG. 28*a*. It is open at one end, closed at the opposite end, has a wall of uniform cross section and may be produced by dip processing. An alternative form shown in FIGS. 28*b* and 28*c* is comprised of a tube 17*b* which is originally open at both of its ends and whose bottom end is closed by folding it back upon itself by means of a clip 201. The clip 201 may carry a suitable pin 203 by which the closed end of the tube may be attached to the tip of the bladder support member.

Alternatively, as shown in FIG. 28*d*, the bladder may be slightly tapered from its open end to its closed end and may carry a beaded rim 204 to facilitate its anchoring in the valve assembly 39 as illustrated in FIG. 16.

In addition to the flat and beaded terminations for the bladder 17, other terminations may also be used, some of which are illustrated in FIGS. 28*e*–28*i*. The purpose of these possible variations is to facilitate the anchoring of the bladder neck 29 between the inner and outer glands 63 and 65. Thus, the bladder neck may be flared (FIG. 28*e*), beaded (FIG. 28*f*), flanged (FIG. 28*g*), outwardly flanged and funneled with a beaded end (FIG. 28*h*), or simply outwardly flanged (FIG. 28*i*).

Additional variations in bladder configuration may also occur at its closed end. Thus, as shown in FIGS. 28*j* and 28*k* a tab 205 may extend from the blind end of the bladder shown in side view in FIG. 28*j* and in cross section in FIG. 28*k*. An opening 207 extends through the tab 205 and the bladder 17*j* is attached to the tip of the support member 31 by means of a fastener through the opening 207. Alternatively, as shown by FIGS. 28*l* and 28*m*, which illustrate the same bladder bottom portion in plan and side view, a tab 209 may extend from the blind end of the bladder terminating in a bead 211 which may be inserted in a slot provided for that purpose in the tip of the support member 31. The bead 211 may extend axially from the tab 209 or it may be offset slightly to one side as shown in FIG. 28*n*, wherein an offset bead 214 extends from a tab 212 depending from the bottom of the bladder 17*n*.

Yet another variation may occur in the shape of the bladder at its closed end. It may be slightly pointed (FIG. 28*o*), or it may be flat (FIG. 28*p*), rather than being hemispherical in the manner illustrated in FIG. 28*a*.

Finally, the bladder may be circular in cross section (FIG. 28*q*), oval (FIG. 28*r*), or rectangular (FIG. 28*s*). The flattened configurations represented by FIGS. 28*r* and 28*s* have certain advantages for larger sized bladders in that they tend naturally to flatten, and therefore require less pull to cause their opposite walls to contact one another than is the case with a bladder of circular cross section, such as that illustrated in FIG. 28*q*.

Alternative means for attaching the closed end of the bladder 17 to the tip of the bladder support member 31 are shown in FIGS. 23–27. As shown in FIG. 23*a*, one manner of attaching the bladder to the tip 33 of the bladder support member 31 is to provide a slot 213 in the tip 33 and to clamp the end of the bladder 17 inside a deformable clip 215 having a pin 217 extending therefrom and adapted to be slipped into and to be retained in the slot 213. The particular clip illustrated in FIGS. 23 and 23*a* is made of a continuous strip of metal through the center of which the pin 217 extends, and in which the pin is anchored by a roughly pyramid-shaped head 219. The opposite end of the pin 217 is in the form of a ball 221 which once inserted through the widened eye of the slot 213 and slipped down through

the slot is securely retained therein. The bladder **17** is shown crimped between the opposite wall portions of the clamp **215** in FIG. **23.**

A non-metallic, typically plastic, fastener which is also designed primarily for use with a bladder having a closed or blind end, such as that illustrated in FIG. **28***a* is shown in FIGS. **24** and **24***a*. The non-metallic clip of FIGS. **24** and **24***a* includes a back wall portion **225** from which a pair of opposed flexible anchoring arms **227** and **229** extend. The flexible arms **227** and **229** terminate in a pair of latching tips **231** and **233** which are adapted to be inserted into a corresponding pair of slots **235** and **237** in the support member tip **33**, as best shown in FIG. **24.** By virtue of cam surfaces carried by the latching tips **231** and **233** and by the slots **235** and **237**, as the arms **227** and **229** of the clip **223** are inserted into the slots **235** and **237** they are forced to bend toward one another until the latching tips **231** and **233** clear the edges of the slots **235** and **237**, after which they snap back and are captured therein.

A plunger **239** extends from between the arms **227** and **229** and into a registering depression **241** in the tip **33.** The bladder **17** is attached to the tip **33** of the bladder support member **31** by laying its extreme end on top of the depression **241** and between the slots **235** and **237.** With the bladder in this position, the clip **223** is snapped in place upon the support member tip **33** as a result of which the plunger **239** enters the depression **241,** clamping and crimping the walls of the bladder **17** securely between them.

Yet another approach to attaching the bladder **17** to the support member **31** is shown in FIGS. **25** and **25***a* wherein a one-piece deformable clip **243** is illustrated. The clip **243** has a rear portion **243***a* in which the bladder **17** may be inserted and a front portion **243***b* which is initially flat and which in that flat state may be inserted into a flat slot **245** extending through the tip **33.** Once the bladder **17** has been inserted into the clip **243** and the clip has been pushed into the slot **245** a crimping tool is applied to the bottom **247** of the clip **243** and also to its head **243***b*. By means of the crimping tool the clip bottom **247** and the clip head **243***b* are pushed toward one another which has the effect both of crimping the bladder **17** within the clip **243** and of riveting the head **243***b* of the clip within the slot **245.**

In cases where the bladder embodiments with the beaded bottoms, such as those shown in FIGS. **28***l*, **28***m*, and **28***n*, are used, they are held as shown in FIGS. **26** and **26***a* within a slot in the support member tip **33.**

Finally, the closed end of a bladder may be attached to the tip **33** of the bladder support member **31** by providing the bladder with a perforated tab as shown in FIGS. **28***j* and **28***k* and fastening the tab through the perforation as shown in FIGS. **27** and **27***a*. In particular, the tip **33** of the support member **31** has a cylindrical opening **249** extending therethrough, the opening having a constricted portion on the back side of the tip and a wider portion entering from the front side of the tip which forms part of the bladder support surface **25.** The bladder **17** is fastened upon the tip **33** by first inserting a hollow rivet **251** through the narrow end of the opening **249,** then stretching the bladder so as to hang its tab by means of the opening in that tab upon the shank of the rivet **251** and finally crimping the rivet so as to flatten its head, thereby anchoring it securely in the opening **249** while at the same time crimping its flaring opposite end against the bladder tab **205.**

Some or all of the features described hereinabove may be applied not only in a container having a single chamber and a single pressurized capsule but also in a multi-chamber container wherein each chamber contains its individual pressurized capsule. An example of such a device is illustrated in FIG. **29.** Shown there is a single container **253** containing a first and a second chamber **255** and **257** separated by a common wall **259.** The shapes of the individual chambers **255** and **257** are determined by the desired overall cross sectional configuration of the container **253** which may be rectangular or any other shape dictated by functional or aesthetic considerations.

Extending into the respective chambers **255** and **257** are identical pressurized capsules **261** and **263** which are shown as being identical to the pressurized capsule **15** illustrated in FIGS. **1–4.** A single actuator **265** is provided to control the valve assemblies of the respective capsules **261** and **263.** In particular, the actuator **265** is provided with a pair of spaced-apart hollow plungers **267** and **269** which enter into respective ones of the valve assemblies and which serve to draw fluid through those valve assemblies when the actuator **265** is depressed. Both of the plungers **267** and **269** are vented through a common passage **270** leading to and through the spout (not shown) of the actuator **265,** thereby providing a mixing of the two fluids contained in the respective capsules.

Alternatively, separate spouts may be provided where the contents of the capsules are to be dispensed concurrently but separately. Naturally, separate actuators, one for each of the capsules **261** and **263** may also be provided where it is desired that their contents be dispensed both separately and independently.

Yet another important alternative to the aforementioned embodiment is illustrated in FIGS. **30–33.** The embodiment of FIGS. **30–33** is similar to that illustrated in FIG. **16** in that an elongated bladder **17***f* is anchored at its neck **29***f* between an interlocking inner gland **63***f* and outer gland **65***f* and wherein the valve spring, valve stem, and valve gasket (not shown) are held in their operative positions inside the inner gland **65***f* by a locking cap **67***f* in the same manner illustrated in and explained with reference to FIG. **16.** In addition to these components, however, the assembly illustrated in FIGS. **30–33** also includes a flexible bag **271** inside the bladder **17***f*. As explained in the introductory portion of this description, the function of the flexible bag **271** is to provide an inner lining for the bladder **17***f* which separates the bladder wall from the bladder contents. The configuration of the bag **271** shown in FIGS. **30–33** is one which is believed to be particularly suitable or insertion into an elongated bladder. While the bladder **17***f* is made capable of expanding by virtue of its resiliency, the bag **271** is given the same capability by appropriate folds therein. Thus, to permit the bag **271** to expand longitudinally its bottom portion **273** is folded back into its top portion **275** so that the bottom and top bag portions **273** and **275** are adjacent one another. The top bag portion **275** then extends around the neck **29***f* of the bladder **17***f* so as to be clamped, together with the bladder neck **29***f*, between the inner and outer gland members **63***f* and **65***f*. In addition, the longitudinally folded bag, with its walls **273** and **275**

forming a double wall, is then accordion folded with pleats **276** extending radially as shown in FIG. **31.**

The sequence of the above operation is such that first the bag **271** is folded both longitudinally and radially; its upper end is conveniently pulled onto the inner gland **63***f*. After this step has been accomplished, the bladder **17***f* is conveniently installed by pulling its neck **29***f* on top of the upper end of the bag **271** around the inner gland **63***f*, following which the outer gland **65***f* is slipped up around the bladder **17***f* and snapped in place around the inner gland **63***f*. *With the bag 271 and the bladder 17f* thus clamped in place between the gland members **63***f* and **65***f* the bladder **17***f* is stretched along the bladder support member **31***f* shown in cross section in FIG. **32.**

It is desirable that the support surface **25***f* of the bladder support member **31***f* be concave in order to accommodate the bladder **17***f*, which will be caused to have a considerably thicker cross section by virtue of the bag **271** therein.

FIGS. **33***a* and **33***b* show the bladder and bag combination in their partially expanded and fully expanded conditions. In FIG. **33***a* the bladder is shown inflated partly, with its bottom extending only slightly below the tip of the support member **31***f*. The bag **271** is also only partly unfolded, with a substantial part of the longitudinal fold, in which the bottom portion **273** extends into the upper portion **275,** still remaining. The bag **271** is shown almost completely unfolded and the bladder **17***f* is shown in its fully inflated state in FIG. **33***b*.

It may be seen from FIG. **33***b* that even though the bag **271** fits inside the bladder **17***f* when the bag is in its folded, empty condition, when the bag is filled and hence unfolded, its size exceeds substantially the size of the bladder **17***f* in its contracted position. In other words, the bag **271** is made as capable of increasing its size by virtue of its folds as is the bladder by virtue of its resiliency.

What is claimed is:

1. In a pressurized apparatus including a container whose volume generally defines the volume of the fluid stored therein; said container having outlet means permitting discharge of the contained fluid, the improvement comprising:

a. an elongate resilient bladder having wall means defining a fluid chamber interior of the bladder and a fluid outlet in fluid communication with said chamber and said container outlet means;

b. an elongate rigid member within said container spaced from said container walls, and lying exterior of said bladder; and

c. means for fixedly attaching respective ends of said bladder to the outlet means and the rigid member with surface contact therebetween over substantially the complete surface area of one side of said bladder to pretension said bladder to the extent of providing the sole pressurizing force for discharging the contained fluid when the bladder is in contracted condition.

2. The apparatus of claim **1** wherein said elongate rigid member comprises a longitudinally convex spatulate member.

3. Apparatus according to claim **2** wherein said bladder is pressed by means of a snap action fastener into a recess in the free end of said spatulate member.

4. The pressurized apparatus of claim **1** wherein said elongate member is longitudinally convex.

5. The pressurized apparatus of claim **4** wherein said bladder is stretched against said convex surface by attaching one end of said bladder to the end of said elongate member remote from said outlet means.

6. The pressurized apparatus of claim **5** wherein said bladder is blind at one end, has a tab extending from said blind end, and is attached to said elongate member by means of said tab.

7. The pressurized apparatus of claim **5** wherein said elongate member is rigidly mounted within said container.

8. The pressurized apparatus of claim **2** wherein said elongate member is flexibly mounted within said container in order to allow said member to adjust to the configuration of said container.

9. The apparatus of claim **1** wherein said elongate rigid member is a longitudinally bowed, generally spatulate member, said bladder being stretched against the longitudinally convex side of said member.

10. The apparatus of claim **9** wherein said spatulate member is rigidly mounted at one of its ends within said container.

11. The apparatus of claim **9** wherein said spatulate member is flexibly mounted at one of its ends in order to allow said body to adjust to the configuration of said container.

12. Apparatus according to claim **1** wherein said bladder contains a flexible, folded bag to serve as a liner for the fluid chamber of said bladder.

13. Apparatus according to claim **12** wherein said folded bag, when unfolded, is larger than said bladder in its contracted position.

14. Apparatus according to claim **13** wherein said bag is first folded back into itself so that the inner wall of its lower portion is adjacent to the inner wall of its upper portion and is then accordion folded so as to create radially extending pleats.

15. In a pressurized apparatus including outlet means permitting discharge of a contained fluid, the improvement comprising:

a. a resilient bladder having wall means defining a fluid chamber interior of the bladder and an opening in communication with the interior of the bladder;

b. a flexible bag for holding said fluid, said flexible bag positioned within said bladder, said bag having a fluid outlet extending through the opening of said bladder and in fluid communication with said outlet means;

c. an elongate rigid member lying exterior of said bladder; and

d. means for fixedly attaching respective ends of said bladder to said outlet means and said rigid member with the bladder stretched longitudinally against said rigid member with surface contact therebetween over substantially the complete surface area of one side of said bladder to pretension said bladder to the extent of providing the sole pressurizing force for discharging the contained fluid when the bladder is in contracted condition.

16. The capsule of claim **15** wherein said bag, bladder, and member are elongate, said bladder and bag being fixed relative to one end of said member, said bladder being additionally fixed relative to the opposite end of said member so as to be stretched longitudinally therealong.

17. The capsule of claim **16** wherein said bag, when filled, is larger than said bladder in its contracted position.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,767,078 Dated October 23, 1973

Inventor(s) Norman Gortz and Michael B. Maccarone

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 5, "reaches" should be --receives--; line 24, "pushed" should be --pushes--; line 40, "mendrel" should be --mandrel--; Col. 2, line 62, "inelt" should be --inlet--; Col. 4, line 18, after "perspective" insert --view--; line 31, "perspectve" should be --perspective--; line 38, "or" should be --for--; Col. 7, line 5, "fo" should be --for--; line 51, "remaining" should be --retaining-- Col. 8, line 66, "llustrated" should be --illustrated--; Col. 10, line 8, "ithe" should be --in the--; Col. 11, line 29, after "45b and" insert --the--; Col. 12, line 15 "this" should be --This--; line 56, "nay" should be --any--; Col. 13, line 25, "o" should be --of--; line 31, "bladde" should be --bladder--; line 55, "surface" should be --bottom--; Col. 16, line 56, "or" should be --for--; Col. 17, lines 11 and 12, the words "With the bag" and "and the bladder" should not be in italics.

Signed and sealed this 25th day of June 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents